Labor Market Outcomes of Cancer Survivors

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Cancer detection in working age people

- Screening is recommended for working age people, and as screening. technology improves, tumors of smaller size that would have gone unnoticed will be detected and treated.
- Treatment is aggressive, even for early stage tumors.

Cancer detection in working age people

- Individuals are likely to bear the consequences of cancer during their working years when they may have otherwise lived and functioned for some time without knowledge or effects of their disease.

Our past work

- Breast cancer has a long-term negative effect on labor supply (9 percentage points).
- But, for women who remained working, they worked more hours per week relative to non-cancer controls.

Research aims

- Determine how employed individuals diagnosed with cancer change their labor supply.
- Determine how employed spouses of an individual diagnosed with cancer change their labor supply.
- Examine if labor supply changes lead to changes in health insurance and income.

Research design

- Inception cohort of women diagnosed with breast cancer and men diagnosed with prostate cancer.
- Longitudinal with assessment periods at 6, 12, and 18 months following diagnosis relevant to a period 3 months prior to diagnosis.
- Comparisons made to a non-cancer control group.

Role of the control group

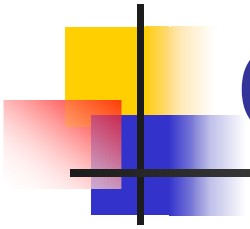
- Causal effect of cancer can only be inferred if people with the disease make labor supply changes at a higher rate than the control sample.
- Labor market conditions over the course of the study can confound the effects of cancer.

Data sources

- Cancer: Detroit Metropolitan Surveillance, Epidemiology, and End Results (SEER) registry
- Controls: Detroit Primary Metropolitan Statistical Area (PMSA) of the Current Population Survey (CPS)
  - Conducted by the Bureau of Labor Statistics

Inclusion criteria

- Age between 30 and 65 at the time of diagnosis
- English speaking
- Employed or with an employed spouse
  - Focus on where economic impact is greatest
  - Non-employment is a persistent state for older men & women.



Cancer subjects

- 496 women with breast cancer
- 294 men with prostate cancer

Current Population Survey

- Not all MIS's contain the same information (e.g., wages are in outgoing rotation groups, insurance is in March supplement).
- Not a "perfect" match to a cancer sample (e.g., younger, lower socioeconomic status).
- Much less expensive than additional primary data collection.

Control subjects

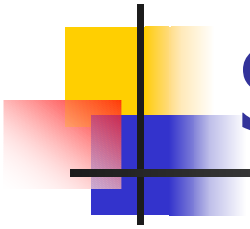
- Compare MIS 4 to MIS 5 for the baseline to 6-month assessment.
- Compare MIS 1 to MIS 8 for the baseline to 12-month assessment.
- No comparison for the 18-month assessment.

Breast cancer and labor supply

- Outcomes
  - Probability of employment following diagnosis
  - Weekly hours worked following diagnosis

Selection bias

- Dedicated workers remain at work regardless of cancer.
  - Study changes in hours worked.
- Minimally effected by the disease and/or its treatment.
  - Will bias the negative affect of cancer toward zero.



Sampling issues

- Differences in the cancer and control groups can lead to biased estimates of the effect of cancer.
- Socioeconomic differences were apparent in the two groups.
- Statistically correct for differences using propensity score methods.

Descriptive statistics

- 31% of breast sample were non-employed 6-months following diagnosis
- 16% of control sample were non-employed MIS 5
- Illustrates important role of the control group
- Demographic differences between cancer and control groups

Table 1. Descriptive statistics for the cancer and Detroit CPS sample

	Breast sample employed (n=445)	Detroit employed PMSA MIS 4 (n=372)
Breast Cancer		
In situ	25.84%	N/A
Local	42.02%	N/A
Regional/Distant	28.99%	N/A
Invasive/unknown	3.15%	N/A
Mean age	50.62 (7.57)***	44.59 (7.88)
Race/ethnicity		
White, Hispanic, non-black	77.98%	78.76%
African-American, non-Hispanic	22.02%	21.24%
Marital status		
Married	60.22%***	64.52%
Divorced, separated or widowed	29.89%***	20.43%
Never married	9.89%***	15.05%
Children ≤ 18	31.24%***	49.19%
Education		
No high school diploma	4.94%***	5.91%
High school diploma	22.25%***	35.22%
Some college	38.43%***	25.81%
College degree	34.38%***	33.06%
Household income		
≤$20,000	7.21%	10.31%
≥$75,000	41.16%	39.38%
Employment characteristics		
Employed at 1st interview	100.00%	100.00%
Employed at 2nd interview	68.54%***	84.14%
Mean hours worked per week 1st interview (workers only)	39.47 (12.30)***	37.67 (10.30)
Mean hours worked per week 2nd interview (workers only)	33.49 (12.30)***	38.09 (9.80)

**Significantly different from the Detroit PMSA sample at p<.05, ***p<.01.

Probability of employment

- 18 percentage points less likely to be employed 6 months following diagnosis relative to controls.
- No statistically significant effect for women with *in situ* cancer.
- Greater negative effect associated with invasive cancer stages.

Table 2. Probability of employment, conditional on prior employment, n=747

Independent variables	(1) Base model	(2) Stage included	(3) Propensity score
Propensity score	N/A	N/A	-.22 (.26)
Breast cancer yes/no	-.18 (.03)***	N/A	-.17 (.03)***
In situ	N/A	-.02 (.06)	N/A
Local	N/A	-.18 (.05)***	N/A
Regional/Distant	N/A	-.34 (.06)***	N/A
Unknown cancer stage	N/A	-.16 (.15)	N/A
African-American	-.13 (.05)***	-.12 (.05)***	-.12 (.04)***
Age	-.001 (.003)	-.001 (.003)	.0041 (.01)
Never married	.04 (.06)	.06 (.05)	.04 (.06)
Separated, widowed, divorced	.01 (.04)	.001 (.04)	-.00 (.04)
High school	-.03 (.08)	-.03 (.08)	-.04 (.08)
Some college	.04 (.07)	.04 (.07)	.06 (.08)
College graduate	.04 (.07)	.02 (.08)	.04 (.08)
Number of children ≤18	-.02 (.02)	-.02 (.02)	-.02 (.02)
Household income ≥$75,000	.03 (.04)	.04 (.04)	.03 (.04)
Household income ≤$20,000	-.06 (.07)	-.07 (.07)	-.08 (.06)

Notes: *Significant at p<.10, **p<.05, ***p<.01.

Probability of employment

- Estimates are robust when propensity score is added to the model.
- In terms of the controls, only the coefficient for African-American women was statistically significant.

African-American women

- Estimated separate models for White and African-American women.
- The effect of breast cancer on the probability of employment was twice as strong for African-American women.
  - -.35 vs. -.14, $p<.01$
  - Explored demographic differences (e.g., age, marital status), income, and physical demands on the job, but were unable to explain differences in employment.

Hours worked

- Nearly 7 hours or 18% fewer hours worked per week by women with breast cancer.
- Negative effect for every stage ranging from 12% (*in situ)* to 28% (unknown) fewer hours worked per week.

Table 3- Changes in weekly hours worked, conditional on 2nd period employment, n=540

Independent variables	(1) Raw change	(2) Raw change	(3) Raw change, propensity score	(4) Percent change	(5) Percent change	(6) Percent change, propensity score
Propensity score	N/A	N/A	2.67 (6.96)	N/A	N/A	-0.05 (0.23)
Breast cancer (yes/no)	-6.68 (0.87)***	N/A	-6.97 (0.85)***	-0.18 (0.03)***	N/A	-0.19 (0.03)***
In situ	N/A	-3.70 (1.15)***	N/A	N/A	-0.12 (0.04)***	N/A
Local	N/A	-6.94 (1.04)***	N/A	N/A	-0.18 (0.03)***	N/A
Regional/distant	N/A	-10.18 (1.27)***	N/A	N/A	-0.28 (0.04)***	N/A
Unknown stage	N/A	-6.22 (3.12)**	N/A	N/A	-0.16 (0.10)	N/A
African-American	-0.62 (1.07)	-0.57 (1.05)	-0.71(1.15)	-0.03 (0.04)	-0.03 (0.03)	-0.04 (0.04)
Age	0.18 (0.06)***	0.18 (0.06)***	0.12 (0.16)	0.004 (0.002)*	0.00 (0.00)*	0.01 (0.01)
Never married	-0.99 (1.44)	-0.33 (1.43)	-1.23 (1.50)	-0.04 (0.05)	-0.02 (0.05)	-0.04 (0.05)
Separated, widowed, divorced	-0.51 (1.07)	-0.54 (1.05)	-0.99 (1.07)	-0.02 (0.04)	-0.02 (0.03)	-0.03 (0.04)
High school	-2.17 (1.98)	-2.24 (1.95)	-2.24 (2.03)	-0.06 (0.07)	-0.06 (0.06)	-0.06 (0.07)
Some college	-2.19 (1.95)	-2.15 (1.92)	-2.66 (2.03)	-0.06 (0.06)	-0.05 (0.06)	-0.06 (0.07)
College graduate	-1.82 (1.99)	-2.02 (1.96)	-2.04 (1.99)	-0.07 (0.07)	-0.08 (0.07)	-0.07 (0.07)
Number of children ≤18	1.10 (0.51)**	1.19 (0.50)**	1.02 (0.51)**	0.03 (0.02)	0.03 (0.02)*	0.02 (0.02)
Household income ≥$75,000	-1.88 (0.98)*	-1.82 (0.96)*	-1.91 (0.97)**	-0.05 (0.03)	-0.05 (0.03)	-0.05 (0.03)
Household income ≤$20,000	-0.05 (1.62)	-0.47 (1.60)	0.23 (1.69)	0.01 (0.05)	0.00 (0.05)	0.01 (0.06)

*Significant at p<.10, **p<.05, ***p<.01.

What happens to women who become non-employed?

- 14% of previously employed women report that they "have a job, but are not working."
  - Perhaps they will return since the have not severed ties with their employer.
- 2% retired and 10% considered themselves as disabled or unable to work.
  - Non-employment maybe more permanent for these individuals.

Employment Transitions

Table 4. Employment transitions from baseline/MIS 4 to 6 months following diagnosis/MIS 5

Breast Cancer Sample Baseline (n=479)	**N**	**(1) Employed**	**(2) Non-employed; has job**	**(3) Non-employed; without job**	**(4) Non-employed; retired**	**(5) Disabled or unable to work**
Employed	443	305 (69%)	60 (14%)	25 (5%)	8 (2%)	45 (10%)
Non-employed; has job	3	0 (0%)	2 (67%)	1 (33%)	0 (0%)	0 (0%)
Non-Employed; without a job	33	1 (3%)	0 (0%)	32 (97%)	0 (0%)	0 (0%)
CPS Sample MIS 4 (n=576)	**N**					
Employed/Working	370	313 (85%)	19 (5%)	36 (10%)	0 (0%)	2 (.5%)
Employed/Not working	29	24 (83%)	1 (3%)	5 (17%)	0 (0%)	0 (0%)
Non-Employed	177	27 (15%)	0 (0%)	122 (69%)	20 (11%)	8 (4%)

Reasons why no longer working

- 74% illness
- 19% “other”
- 6% lay-off
- 1% family or personal obligation

12- and 18-month Employment outcomes

Table 5. Employment outcomes of cancer survivors relative to CPS respondents

	Cancer sample			
BREAST	**(1) Baseline n=497**	**(2) 6 months n=494**	**(3) 12 months n=463**	**(4) 18 months n=453**
Employment	446 (89.7)	307** (62.2)	344** (74.3)	342 (75.5)
Hours worked (workers only)	39.5 (12.3)	33.4** (12.3)	36.3** (12.3)	37.1* (12.0)
Hourly wage (workers only)	19.0 (12.1)	20.2 (13.4)	20.1 (11.7)	20.2 (11.7)

12- and 18-month employment outcomes

- Many women with breast cancer appear to return-to-work 12 months following diagnosis
- Women who remain working, continue to work at or near full-time
- If half of the non-employment effect is attributable to cancer, women with breast cancer will be about 13 percentage points less likely to work relative to the non-cancer control group.

Similar descriptive findings for prostate sample

- Substantial demographic differences between cancer and control groups.
- 28% of prostate sample were non-employed 6-months following diagnosis, but at 12- and 18-months following diagnosis 20% and 18% were non-employed.
- 11% of control sample were non-employed MIS 5 and 14% were non-employed at MIS 8.

Table 6. Descriptive statistics for the cancer and Detroit CPS sample

	(1) All Prostate Sample (n=294)	(2) All Detroit PMSA MIS 4 (n=383)	(3) All Detroit PMSA MIS 1 (n=349)
Prostate Cancer			
In situ/ Local	215 (73.13%)	N/A	N/A
Regional/Distant	58 (19.73%)	N/A	N/A
Invasive/unknown	21 (7.14%)	N/A	N/A
Treatment			
No treatment	12 (4.08%)	N/A	N/A
Hormone or Radiation	59 (20.07%)	N/A	N/A
Surgery	193 (65.65%)	N/A	N/A
Surgery plus Hormone, Chemotherapy, or Radiation	30 (10.20%)	N/A	N/A
Mean age	56.27 (5.88)***	49.65 (7.09)	49.53 (6.88)
Race/ethnicity			
African-American, non-Hispanic	74 (25.17%)***	61 (15.93%)	53 (15.19%)
Marital status			
Married	239 (81.29%)*	278 (72.58%)	257 (73.64%)
Divorced, separated or widowed	37 (12.59%)*	62 (16.19%)	57 (16.33%)
Never married	18 (6.12%)*	43 (11.23%)	35 (10.03%)
Children ≤ 18 living at home	57 (19.39%)***	146 (38.12%)	132 (37.82%)
Education			
No high school diploma	18 (6.12%)***	32 (8.36%)	36 (10.32%)
High school diploma	51 (17.35%)***	135 (35.25%)	113 (32.38%)
Some college	101 (34.35%)***	113 (29.50%)	107 (30.66%)
College degree	124 (42.18%)***	103 (26.89%)	93 (26.65%)
Household income			
≤$20,000	9 (3.16%)***	27 (8.31%)	25 (8.65%)
≥$75,000	170 (59.65%)***	123 (37.85%)	114 (39.45%)
Employment characteristics			
Employed at baseline	267 (90.82%)***	282 (73.63%)	254 (72.78%)
Mean hours worked per week baseline (n=265)	46.16 (12.62)	44.16 (9.41)	46.08 (9.82)

Notes: *Statistically significant from cancer subjects p<.10, ** p<.05, ***p<.01.

Employment Changes

Table 7. Employment changes, conditional on employment at baseline

	Prostate sample				CPS baseline to 6 months		CPS baseline to 12 months	
	(1) Baseline	(2) 6 months	(3) 12 months	(4) 18 months	(5) MIS 4	(6) MIS 5	(7) MIS 1	(8) MIS 8
N	267	264	246	235	282	282	254	254
Employment	267 (100%)	191 (72.35%)***	198 (80.49%)***	194 (82.55%)***	282 (100%)	252 (89.36%)***	254 (100%)	220 (86.61%)***
Hours worked (workers only)	46.16 (12.62)	42.30 (12.25)***	44.18 (13.22)	44.99 (12.73)	44.16 (9.41)	43.85 (9.00)	46.08 (9.82)	43.47 (8.80)***

Notes: CPS=Current Population Survey, MIS=Month-in-Sample. Standard deviation shown in parentheses for weekly hours worked (workers only). ***Statistically significant change compared to baseline interview (prostate sample) or prior interview (CPS sample) $p<.01$.

Probability of employment

- 9 percentage points less likely to be employed 6 months following diagnosis relative to controls.
- No statistically significant effect for stage, more of a treatment effect.
- Greater negative effect associated with surgical interventions at 6 months and possibly at 12 and 18 months.

Probability of employment

- Prostate cancer survivors are not statistically different from non-cancer controls 12 and 18 months following diagnosis.

Table 8. Probability of employment, all subjects employed at baseline

	6-months following diagnosis/MIS 4			12-months following diagnosis/MIS 8			18-months following diagnosis
Independent variables	**(1) PCA**	**(2) Treatment**	**(3) Propensity score**	**(4) PCA**	**(5) Treatment**	**(6) Propensity score**	**(7) Treatment**
Propensity score	N/A	N/A	-.35 (.21)	N/A	N/A	-.35 (.43)	N/A
Prostate cancer yes/no	-.09 (.04)**	N/A	-.09 (.04)***	.03 (.05)	N/A	.04 (.04)	N/A
Surgery only	N/A	-.13 (.05)**	N/A	N/A	.01 (.04)	N/A	-.05 (.05)
Surgery plus	N/A	-.17 (.10)*	N/A	N/A	.10 (.04)	N/A	-.02 (.09)
Hormone, radiation, watchful waiting	N/A	.09 (.04)**	N/A	N/A	.05 (.05)	N/A	Reference group
African-American	-.02 (.05)	-.05 (.05)	.05 (.06)	.04 (.04)	.04 (.04)	.11 (.10)	.00 (.06)
Age	-.01 (.00)***	-.01 (.00)***	-.00 (.01)	-.01 (.00)***	-.01 (.00)***	-.00 (.01)	-.02 (.01)***
Never married	-.09 (.08)	-.10 (.09)	-.05 (.07)	-.04 (.08)	-.05 (.08)	-.00 (.08)	-.02 (.10)
Separated, widowed, divorced	-.00 (.05)	-.02 (.05)	-.02 (.05)	.02 (.05)	.02 (.05)	.02 (.06)	.07 (.05)
High school	.06 (.06)	.05 (.07)	.08 (.09)	.06 (.06)	.05 (.06)	.06 (.08)	-.03 (.11)
Some college	.12 (.06)**	.11 (.06)*	.21 (.08)**	.03 (.07)	.02 (.07)	.07 (.08)	.03 (.08)
College graduate	.16 (.07)**	.14 (.07)**	.23 (.08)**	.03 (.07)	.02 (.07)	.09 (.09)	-.01 (.09)
Number of children ≤18	.03 (.03)	.02 (.03)	-.01 (.02)	.01 (.02)	.01 (.02)	-.01 (.03)	.02 (.05)
Household income ≥$75,000	.01 (.04)	.02 (.05)	.04 (.04)	.07 (.04)*	.08 (.04)*	-.07 (.04)	.02 (.05)
Household income ≤$20,000	-.01 (.10)	-.00 (.10)	.02 (.11)	-.03 (.11)	-.02 (.10)	-.06 (.11)	-.15 (.22)

Notes: Notes are the same as in Table 3. *Significant at p<.10, **p<.05, ***p<.01.

Policy implications

- Substantial work loss attributable to cancer.
- Awareness of work loss related to detection and treatment.
- Work loss is an important outcome that should be considered when evaluating cancer treatments.
- Number of cancer survivors in the work force.
- Sponsor interventions that improve time to recovery and minimize economic loss.

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